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Model of a programmable quantum processing unit based on a quantum transistor effect

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Abstract

© 2018 Author(s). In this paper we propose a model of a programmable quantum processing device realizable with existing nano-photonic technologies. It can be viewed as a basis for new high performance hardware architectures. Protocols for physical implementation of device on the controlled photon transfer and atomic transitions are presented. These protocols are designed for executing basic single-qubit and multi-qubit gates forming a universal set. We analyze the possible operation of this quantum computer scheme. Then we formalize the physical architecture by a mathematical model of a Quantum Processing Unit (QPU), which we use as a basis for the Quantum Programming Framework. This framework makes it possible to perform universal quantum computations in a multitasking environment.

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